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ABSTRACT

For one important set of data, namely, the data on unemployment and employment collected by the Census Bureau in its monthly Current Population Survey (CPS), some information on nonsampling error is available that can be used to evaluate the regularly reported labor force figures. The paper is concerned with the nonsampling error that relates specifically to measurement, or response bias (the bias resulting from the interview and enumeration process itself). It examines and tabulates the extent of the response bias and its effect on national estimates of unemployment and employment. Unemployment rates corrected for this bias are estimated and compared with official unemployment rates. Cyclical and secular differences between official and bias-adjusted estimates of unemployment are noted, and the alternative unemployment rates are related to such cyclically sensitive variables as GNP (Gross National Product) gap, wage rates, and labor force participation rates. Census reinterviewing data, up to now unexploited, contain new, potentially valuable economic information. The data indicates that when the official unemployment rate is adjusted, it is consistently and significantly higher, with the gap between the unadjusted and the adjusted rate widening in the most recent quarters. The reinterview data also indicate that the CPS consistently understates total employment. (Author/LH)

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Methods for Manpower Analysis *No. 11*

Cyclical Behavior of Bias-Adjusted Unemployment

By

ALFRED TELLA

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FOR EMPLOYMENT RESEARCH

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He has published numerous articles on the economics of labor force participation and on the analysis of work incentives. In 1971 the Upjohn Institute published his study, authored jointly with Dorothy Tella and Christopher Green, *The Hours of Work and Family Income Response to Negative Income Tax Plans*. His other publications include *The Effect of Three Income Maintenance Programs on Work Effort* (coauthor), U.S. Chamber of Commerce, 1971; *Technical Studies* (editor), The President's Commission on Income Maintenance Programs, 1970; "Effect of Nonemployment Income and Wage Rates on the Work Incentives of the Poor" (coauthor), *Review of Economics and Statistics*, November 1969; "Labor Reserves and the Phillips Curve" (coauthor), *Review of Economics and Statistics*, February 1968; "The Labor Market and Potential Output of the FRB-MIT Model" (coauthor), *Proceedings of the American Statistical Association, Business and Economic Statistics Section*, December 1967; "Labor Force Sensitivity to Employment by Age, Sex," *Industrial Relations*, February 1965; "The Relation of Labor Force to Employment," *Industrial and Labor Relations Review*, April 1964. He has also authored studies, published by the Conference Board, on such subjects as population growth, marriage rates, and consumer income and expenditure.

Foreword

The W. E. Upjohn Institute for Employment Research is pleased to publish this study on the effect of nonsampling error on estimates of unemployment, with the hope that it will increase awareness of and concern for measurement error in our national labor force statistics and will aid in the interpretation of such statistics.

The total unemployment rate is probably the most widely watched and, deservedly or not, the nation's most influential single statistic. It is an index of psychological and economic hardship and a measure of unused manpower resources. It is used to express our national full employment goal, and it is a key guide for fiscal and monetary policies. It is the trigger that starts or stops the flow of billions of dollars of government funds in a variety of programs. Elections are won or lost on its message. It influences individual and family decisions — whether to seek work or not, to spend, or to save. It is a weathervane of the quality of life.

This study is not concerned with the official concept or definition of unemployment. Rather it deals with an important and frequently overlooked error in the national data that results from the interview and collection process — a type of nonsampling error called *response bias*. Estimates of this error are obtained from Census reinterview surveys and are used to adjust the total unemployment figures. The resulting adjusted unemployment rate proves to be historically higher than the reported one. In recessions, understatement of the unemployment rate has increased.

The author subjects the adjusted unemployment estimates to a series of statistical and econometric analyses and finds that the Census reinterview data add to our understanding of the cyclical behavior of the economy.

We hope that these findings, coupled with previously unpublished labor force data, will prove a useful contribution in macroeconomic analysis, encourage further research on the measurement of unemployment, and lead to improvements in survey and interview techniques.

The author accepts full responsibility for the interpretation of data and any errors in this paper.

Ben S. Stephansky
Associate Director

Washington, D.C.
December 1975

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Cyclical Behavior of Bias-Adjusted Unemployment

Many users of social and economic statistics are unaware of the existence or degree of nonsampling error in current data on unemployment. The magnitude of such error, however, may be greater than the more familiar error due to sampling variability. One reason for this unawareness is that nonsampling error is difficult to conceptualize and measure. For one important set of data, namely, the data on unemployment and employment collected by the Census Bureau in its monthly Current Population Survey, some information on nonsampling error is available that can be used to evaluate the regularly reported labor force figures. The nonsampling error that is of concern here relates specifically to measurement bias, or response bias, i.e., the bias which results from the interview and enumeration process itself. This paper will examine the extent of the response bias and its effect on national estimates of unemployment and employment. Unemployment rates corrected for this bias will be estimated and compared with official unemployment rates. Cyclical and secular differences between official and bias-adjusted estimates of unemployment will be noted, and the alternative unemployment rates will be related to such cyclically sensitive variables as GNP gap, wage rates, and labor force participation rates.

Background

The Current Population Survey (CPS) is a 47,000 household sample survey conducted by the Census Bureau to obtain official monthly estimates of employment, unemployment, and other labor force and population characteristics for the nation and various subgroups of the population. CPS interviews are conducted during the week containing the 19th day of the month and relate to activity or status during the previous week. In the week following the CPS survey, the Census Bureau conducts reinterviews, using different enumerators, for a subsample of about 2,000 of the original CPS households. In a given month reinterviews are conducted for a sample selection of one-sixth of interviewers and a further subsample of one-third of their work. All questions in the reinterview are the same as in the original interview and refer to the same status period as in the original interview. For 80 percent of the reinterview households the reinterviewer compares the responses from the original interview and the re-

The author appreciates the comments of members of the Census staff on an earlier draft and the help of the Statistical Indicators Division, of the Bureau of Economic Analysis, with the data processing. He has benefited from conversations with W. Owens, I. Schreiner, M. Boisen, M. Weitzman, I. Siegel, and G. Narasimham. He especially thanks the Census Director, Vincent P. Barabba, who has unfailingly supported all efforts to increase the utility of Census statistics.

interview, and any differences are reconciled. (Data for the 20 percent non-reconciled households are used to evaluate reinterviewer performance and for administrative purposes.) The reinterviewer and the respondent together attempt to determine the correct answer and ascertain the source of, and possible reasons for, any differences. The main purpose of the reinterviews is to provide the Census Bureau with a quality control check on CPS interviewers. However, the reinterview results can also be used to assess the overall quality of the original survey results, and they represent an untapped source of information for socioeconomic analysis.

The reinterview data have several limitations, including relatively high noninterview rates (around 10 percent missed interviews); a sample that is small for the purpose of estimating detailed characteristics; a rotation group bias that differs from that of the full CPS; occasional months of missing data when reinterviews were not conducted because of the demands of large CPS supplements; the difficulty of clearly identifying the person responsible and the reasons for differences between the original and reinterview responses; and up to now insufficient emphasis on program design to obtain improved estimates of bias.

Nevertheless, there are *a priori* reasons to believe that the reinterview results for some purposes may provide preferred estimates to the original full-sample results. Reinterviewers are generally senior or supervisory personnel who are more highly paid than original interviewers. Reinterviewers are specifically instructed to try to reach the particular person in the household about whom the questions are being asked (self-respondent), whereas the CPS interviewer's manual instructs original enumerators to interview a *knowledgeable* member of the household who usually answers for all persons in the household. In addition, a careful attempt is made in reinterview to reconcile and correct differences in responses between original interview and reinterview. Therefore, the after-reconciliation results can be regarded as the more accurate.

The CPS practice of readily accepting a proxy respondent in the original interview could be expected to produce a downward bias in (lead to an understatement of) both unemployment and employment. In order to be counted as *unemployed* in the CPS, a nonemployed person must have actively looked for work in the preceding four weeks (checked with an employment agency, employer, friend, or relative; placed or answered a want ad; etc.); otherwise he is residually classified as *not in the labor force*. As little as one hour of paid work qualifies a person to be counted as employed. However, it cannot reasonably be assumed that in households with more than one potential earner all adult members of the household have perfect knowledge of each other's activities. Some household members may not be aware of the specific jobseeking activities of other household members or may not know of their occasional or part-time employment. Therefore, the use of proxy respondents in the CPS could

easily result in misclassifying genuinely unemployed and employed persons into the not-in-the-labor-force category, with a consequent understatement of unemployment and employment. Such misclassification would presumably be corrected by self-respondents in reinterview.

As will be shown in this paper, the reinterview results are consistent with this hypothesis. Information obtained during the reconciliation process is also supportive. According to reinterviewer reports, the single most important reason for differences in unemployment between original interview and reinterview is that respondents were not fully informed about the activities of other household members. Other factors associated with understatement of CPS unemployment include not understanding the definition of *looking for work*, thinking of the wrong survey period, misrecording information, not asking all required questions, assuming answers, and conducting interviews under difficult or unfavorable conditions (language problem, sickness in family, intoxication, etc.).[1]

It is also reasonable to expect that the understatement of unemployment would increase in recessions. Given a tendency toward misclassification and understatement of unemployment in original interview, the higher the level of joblessness, the greater the number of persons who would be subject to misclassification. The cyclical behavior of reinterview estimates of unemployment will be analyzed later in the paper.

Gross and Net Changes

Differences in unemployment are largest between original interview and reinterview *prior to reconciliation*. Reconciliation reduces these differences substantially, but gross and net differences after reconciliation often remain large. In 1974, the latest full year for which data are available at this writing, there was a 38 percent average gross shift in unemployment between original CPS interview and reinterview before reconciliation; i.e., the absolute number of persons who moved into and out of unemployment status between interview and reinterview was equal to slightly more than one-third the number who were classified as unemployed upon reinterview prior to reconciliation. The gross shift after reconciliation declined to 22 percent of those finally classified as unemployed, of which half was nonoffsetting (net shift). Most differences involving movements into or out of unemployment were associated with persons other than the head of the household, i.e., women and teenagers. This is the same group that constitutes most of the "labor reserve," or "hidden unemployment" (see Tella, 1965, and Dernburg and Strand, 1966).

[1]According to the unpublished findings of I. Schreiner of the Census Bureau, differences in unemployment between original interview and reinterview are larger when respondents differ or when respondents are proxy on original and self on reinterview than when respondents are self or the same proxy both times.

The analysis that follows is based on net differences in unemployment after reconciliation. The labor force denominator of the unemployment rate also reflects net shifts into and out of employment as well as unemployment.

Annual Estimates

Some indication of the reliability of Census subsample estimates of unemployment can be had by comparing the original CPS interview responses of the reinterview subsample with the original responses of the full CPS sample. Table 1 shows annual unemployment rates (1956-74) for the full sample (UFS) and the original subsample (UOS). The series are quite similar, moving in close cyclical consonance ($r^2 = .92$).[2] In 13 of the 19 years, the two rates were either the same or differed by 0.1 percentage point; in 5 years the difference was 0.2 point; and in 1 year (1965) the difference was 0.5 point. For all years the difference averaged 0.1 point, and for peak and trough years of unemployment the average difference was also 0.1 point. The degree of similarity in the two series would seem to lend credibility to the reinterview sample, at least for estimating yearly unemployment rates, and suggests that the reinterview program's limitations are not fatal. The reinterview subsample would appear to be reasonably representative, and small sample size not a serious problem for aggregate estimates.

The unemployment rate after reconciliation (UAR) is shown in Table 2, together with the percentage point difference between UAR and UOS. As expected, UAR is generally higher than UOS (differences are positive). The implication is that UFS historically has been understated by an annual average of 0.3 percentage point for the period 1956-74. This is equivalent to 7 percent of the mean number of persons unemployed.[3] Average annual differences between UAR and UOS are higher in the second half of the period (1966-74) than in the first half (1956-65), averaging 0.4 and 0.2 percentage point, respectively. These differences are equal to 9 percent and 5 percent, respectively, of the total number of persons unemployed. (The pattern of relatively larger differences in the most recent decade also occurs when UAR is directly compared with UFS.)

[2]See note, Table 1. The correlation is based on historical full-sample data not retrospectively readjusted for subsequent changes in the definition of unemployment in order to be on the same basis as the reinterview data which are not back-adjusted by the Census Bureau. Although not strictly comparable, full-sample annual unemployment rates that have been historically revised for changes in definition remain highly correlated with original (unrevised) estimates of unemployment from the reinterview subsample ($r^2 = .95$).

[3]1.6 standard error of the annual difference in the number of persons unemployed relative to the level of unemployment is equal to about 1½ percentage points. This is equivalent to about 0.1 percentage point in the total unemployment rate (see U.S. Bureau of the Census, 1963, p. 12).

Table 1

Full-Sample and Reinterview Subsample Unemployment Rates 1956-74

Year	Original response full sample	Original response reinterview subsample
1956	3.8	3.7
1957	4.3	4.2
1958	6.8	6.8
1959	5.5	5.6
1960	5.6	5.4
1961	6.7	6.9
1962	5.6	5.5
1963	5.7	5.6
1964	5.2	5.2
1965	4.6	5.1
1966	3.9	4.0
1967	3.8	3.8
1968	3.6	3.7
1969	3.5	3.7
1970	4.9	5.1
1971	5.9	5.9
1972	5.6	5.4
1973	4.9	5.0
1974	5.6	5.5

Note: Since reinterview estimates of unemployment for 1956-66 are available only for persons age 14 and over, full-sample annual estimates for this period are also shown for age 14 and over as initially published, not readjusted for changes in definition adopted in either 1957 or 1967. For 1967 on, all data are for persons age 16 and over. There are 19 scattered months of unavailable reinterview data in the 19-year period 1956-74.

The largest difference in the 19-year period (0.6 percentage point) occurred in 1974, a relatively high unemployment year. In terms of national aggregates this translates to 550,000 additional persons unemployed, equal to 11 percent of total unemployment adjusted to include the understatement. The unemployment rate difference doubled in size between 1973 and 1974, coinciding with a sharp decline in real Gross National Product and a fivefold increase in the GNP gap. At 6.1 percent, UAR was 2.1 percentage points above 4 percent unemployment (as one measure of full employment) while UOS was only 1.6 points higher. However, annual estimates of UAR-UOS do not reveal a consistent relationship to yearly changes in the unemployment rate.

Table 2

Reinterview Subsample Unemployment Rate
1956-74

Year	Reconciled	Reconciled less original response
1956	3.9	0.2
1957	4.3	0.1
1958	7.0	0.2
1959	5.8	0.2
1960	5.7	0.3
1961	7.2	0.3
1962	5.5	0
1963	6.0	0.4
1964	5.7	0.5
1965	5.4	0.3
1966	4.2	0.2
1967	4.3	0.5
1968	4.0	0.3
1969	4.1	0.4
1970	5.5	0.4
1971	6.3	0.4
1972	5.6	0.2
1973	5.3	0.3
1974	6.1	0.6

The comparatively high level of UAR occurred primarily as the result of fewer persons being classified as not in the labor force upon reinterview, i.e., there was a consistent net shift between original interview and reinterview from nonparticipation in the labor force to unemployment, mainly among nonheads of households. Employment upon reinterview was also consistently higher than in original interview, but usually by 1 percent or less per year. By comparison, for the not-in-the-labor-force category, the reconciled reinterview count as a percent of the original subsample estimate ranged between 97 and 99 percent, averaging about 98 percent for the period 1956-74.

The understatement in the originally measured civilian labor force varied between 0.9 percent (1962) and 1.7 percent (1974), averaging 1.2 percent for 1956-74. Over time, the reconciled estimates of the labor force rose relative to the original subsample estimates, mainly because of the growing differential in unemployment. The average yearly percent understatement in the original labor force increased from 1.1 percent in

1956-65 to 1.4 percent in 1966-74. In these same periods the average understatement of the number of persons unemployed rose from 5.2 percent to 9.1 percent, and for the employed it rose from 0.9 to 1.0 percent.

Expressed in terms of full-sample (national) estimates, the understatement of the labor force amounted to 0.7 million in 1956, increased to 0.9 million in 1966, and to 1.5 million in 1974. Employment constituted about 0.5 million, 0.7 million, and 0.9 million of the labor force gap in these three years, respectively. Although the percentage understatement is greater for the number of persons unemployed than for the employed, in terms of a head count the understatement in employment is greater. For the most recent decade, the reinterview data imply an average annual growth rate of the labor force that is about 0.1 point greater than the rate based on full-sample data. Table 3 shows the percent understatement in the labor force, employment, and unemployment for 1956-74 annually.

It should be emphasized at this point that these estimates of understatement are conservative. The 80 percent reconciled sample of households

Table 3

Percent Understatement in Original Subsample Estimates of the Labor Force, Employment, and Unemployment 1956-74

Year	Labor force	Employment	Unemployment
1956	1.08	0.87	6.21
1957	0.88	0.76	3.60
1958	1.17	1.04	3.01
1959	1.08	0.90	4.05
1960	1.09	0.86	5.21
1961	0.99	0.70	4.84
1962	0.86	0.82	1.23
1963	1.22	0.80	8.12
1964	1.21	0.74	9.01
1965	1.35	1.06	6.36
1966	1.25	0.93	8.02
1967	1.59	1.06	13.28
1968	1.42	1.18	8.33
1969	1.44	1.01	11.11
1970	1.13	0.72	8.46
1971	1.39	1.01	7.06
1972	1.41	1.09	6.34
1973	1.44	1.09	7.57
1974	1.65	1.02	11.62

reveals a significantly lower level of differences in response between original interview and initial reinterview than does the 20 percent nonreconciled sample of households. The lower differences for the 80 percent group are attributable to reinterviewers not adhering to the rule of independent interview in conducting the reinterview. Thus, some differences are concealed.

Quarterly Trend-Cycle Estimates

Some additional indication of whether UAR or UAR-UOS contain new economic information can be obtained by correlating these series, and UFS, with other variables that would be expected to be related to unemployment. However, correlations based on annual data would be limiting. Cyclical fluctuations would be dampened, and 19 yearly observations are insufficient to study relationships in subperiods. Therefore, quarterly unemployment rate series for UOS and UAR were assembled from unpublished Census data, starting with the second quarter of 1955 (earliest available), and were seasonally adjusted using the Census X-11 program for quarterly data.

Unfortunately, the quarterly estimates of unemployment based on reinterview data showed sizable random fluctuations, which reflect the relatively small size of the reinterview sample as compared with the full CPS sample.[4] (Full-sample unemployment is virtually noise-free.) Therefore, trend-cycle values of the seasonally adjusted original subsample unemployment rate (TCUOS) and of the reconciled unemployment rate (TCUAR) were derived and are shown in Table 4.

TCUOS follows quarterly UFS (currently reported) reasonably closely ($\bar{r}^2$ = .93, 5502-7402). However, the relationship is closer in the first decade ($\bar{r}^2$ = .98, 5502-6404) than in the second ($\bar{r}^2$ = .86, 6501-7402).

TCUAR is mostly higher than TCUOS (and than UFS), with the largest quarterly differences occurring in runs.[5] The average difference for the 79 quarters shown in Table 4 was slightly less than 0.3 percentage point. Differences were largest (0.4 percentage point or more) for the relatively high unemployment periods 6004-6102, 6301-6403, 7102-

[4]The overall standard deviation of the irregular component for the quarterly original subsample unemployment rate and the reconciled rate was .5 percent (5502-7402, i.e., from the second quarter in 1955 through the second quarter in 1974), although in one year (1972) it was as high as .5 percent or about equal to a variation of 0.5 percentage point in the unemployment rate around trend-cycle values.

[5]A comparison of original interview and reconciled unemployment rates using both seasonally adjusted and unadjusted data reveals that the moving average used in the trend-cycle calculations did not produce the runs in the difference between the two trend-cycle unemployment rates. Rather, the runs are a characteristic of the raw data.

7104, and 7303 on, and for the low unemployment periods 6604-6702, 6804-6902, and 7001-7003.

For comparative purposes an alternative (preferred) unemployment rate was constructed that is adjusted for understatement and also free of the noise evident in the subsample reinterview data. This was done simply

Table 4

Trend-Cycle Unemployment Rate
Original and Reconciled Subsample
Second Quarter 1955—Fourth Quarter 1974

Year and quarter	Original response	Reconciled	Year and quarter	Original response	Reconciled
			6201	5.8	5.8
5502	4.3	4.5	6202	5.4	5.4
5503	4.2	4.4	6203	5.5	5.4
5504	4.0	4.1	6204	5.6	5.7
5601	3.7	3.9	6301	5.6	6.0
5602	3.7	3.9	6302	5.8	6.2
5603	3.9	4.1	6303	5.6	6.1
5604	4.0	4.2	6304	5.4	5.9
5701	4.0	4.1	6401	5.4	5.9
5702	4.0	4.0	6402	5.3	5.9
5703	4.1	4.3	6403	5.1	5.5
5704	4.8	5.1	6404	5.1	5.3
5801	6.2	6.4	6501	5.2	5.5
5802	7.1	7.3	6502	5.1	5.4
5803	7.1	7.2	6503	5.0	5.2
5804	6.7	6.8	6504	4.8	4.9
5901	6.1	6.2	6601	4.3	4.6
5902	5.6	5.7	6602	3.9	4.1
5903	5.4	5.6	6603	3.7	3.9
5904	5.3	5.5	6604	3.6	4.0
6001	5.1	5.3	6701	3.6	4.2
6002	5.2	5.4	6702	3.8	4.3
6003	5.5	5.8	6703	3.9	4.4
6004	6.1	6.5	6704	3.8	4.3
6101	6.7	7.1	6801	3.7	3.9
6102	7.1	7.5	6802	3.7	3.8
6103	7.0	7.3	6803	3.8	4.0
6104	6.5	6.6	6804	3.6	4.0

(Continued)

Table 4 (Continued)

Trend-Cycle Unemployment Rate
Original and Reconciled Subsample
Second Quarter 1955—Fourth Quarter 1974

Year and quarter	Original response	Reconciled	Year and quarter	Original response	Reconciled
6901	3.5	4.0	7201	5.2	5.5
6902	3.6	4.2	7202	5.0	5.2
6903	3.8	4.1	7203	5.0	5.2
6904	4.3	4.5	7204	5.0	5.1
7001	4.8	5.2	7301	5.1	5.2
7002	4.9	5.3	7302	5.1	5.4
7003	5.0	5.4	7303	4.9	5.3
7004	5.6	5.8	7304	4.9	5.4
7101	5.8	6.1	7401	5.1	5.8
7102	6.0	6.3	7402	5.1	5.7
7103	6.0	6.5	7403	5.1	5.7
7104	5.7	6.2	7404	5.9	6.6

Note: For convenience, four-digit numbers are used here and throughout the paper to express time periods (for example, *5502* means the second quarter in 1955). Estimates for 7403 and 7404 are actual values of unemployment adjusted by post-sample estimates of the trend-cycle curve moving average weights. At this writing the available raw data indicate that the reconciled unemployment rate was 0.4 percentage point higher than the original response rate in 7501; 0.7 higher in 7502; and 0.4 higher in 7503.

by subtracting TCUOS from TCUAR[6] and adding the difference to seasonally adjusted UFS. The resulting adjusted rate (UADJ) frequently diverged from TCUAR, with the difference as much as 0.7 percentage point in some quarters. In effect, UADJ is an approximation of UFS corrected for understatement (bias).

Bias-Adjusted Series

UFS and UADJ are shown in Table 5 and Chart 1 for the period 5502-7503. UADJ is higher than UFS, except in four quarters — three where

[6]Trend-cycle rather than seasonally adjusted differences were used because random fluctuations in the original subsample and reconciled series, while similar, were not identical and hence would not have washed out. A multiplicative adjustment factor calculated from the raw reinterview data and applied to the full-sample unemployment rate before seasonal adjustment could be expected to yield slightly, but not significantly, different final trend-cycle estimates. Further research on alternative adjustment methodologies would be useful.

Table 5

Full-Sample and Bias-Adjusted Unemployment Rate
Second Quarter 1955—Third Quarter 1975
(Seasonally Adjusted)

Year and quarter	Full sample	Bias adjusted	Year and quarter	Full sample	Bias adjusted
			6301	5.8	6.2
5502	4.4	4.6	6302	5.7	6.1
5503	4.1	4.3	6303	5.5	6.0
5504	4.2	4.3	6304	5.6	6.1
5601	4.0	4.2	6401	5.5	6.0
5602	4.2	4.4	6402	5.2	5.8
5603	4.1	4.3	6403	5.0	5.4
5604	4.1	4.3	6404	5.0	5.2
5701	4.0	4.1	6501	4.9	5.2
5702	4.1	4.1	6502	4.7	5.0
5703	4.2	4.4	6503	4.4	4.6
5704	4.9	5.2	6504	4.1	4.2
5801	6.3	6.5	6601	3.9	4.2
5802	7.4	7.6	6602	3.8	4.0
5803	7.3	7.4	6603	3.8	4.0
5804	6.4	6.5	6604	3.7	4.1
5901	5.8	5.9	6701	3.8	4.4
5902	5.1	5.2	6702	3.8	4.3
5903	5.3	5.5	6703	3.8	4.3
5904	5.6	5.8	6704	3.9	4.4
6001	5.2	5.4	6801	3.7	3.9
6002	5.2	5.4	6802	3.6	3.7
6003	5.6	5.9	6803	3.5	3.7
6004	6.3	6.7	6804	3.4	3.8
6101	6.8	7.2	6901	3.4	3.9
6102	7.0	7.4	6902	3.4	4.0
6103	6.8	7.1	6903	3.6	3.9
6104	6.2	6.3	6904	3.6	3.8
6201	5.6	5.6	7001	4.2	4.6
6202	5.5	5.5	7002	4.7	5.1
6203	5.6	5.5	7003	5.2	5.6
6204	5.5	5.6	7004	5.8	6.0

(Continued)

Table 5 (Continued)

Full-Sample and Bias-Adjusted Unemployment Rate
Second Quarter 1955—Third Quarter 1975
(Seasonally Adjusted)

Year and quarter	Full sample	Bias adjusted	Year and quarter	Full sample	Bias adjusted
7101	6.0	6.3	7401	5.1	5.8
7102	5.9	6.2	7402	5.1	5.7
7103	6.0	6.5	7403	5.5	6.1
7104	6.0	6.5	7404	6.6	7.3
7201	5.8	6.1	7501	8.3	8.7
7202	5.7	5.9	7502	8.9	9.6
7203	5.6	5.8	7503	8.4	8.8
7204	5.3	5.4			
7301	5.0	5.1			
7302	4.9	5.2			
7303	4.8	5.2			
7304	4.7	5.2			

Note: The adjustment of the full-sample unemployment rate in 1975 is based on quarterly differences in raw reinterview data (UAR-UOS). The data in this table are those available as of December 1975. In 1976 and later years revised seasonal adjustment factors can be expected to raise or lower the full-sample rate in some quarters of recent past years by 0.1 or 0.2 point. The adjusted rate should be revised accordingly by the same amount.

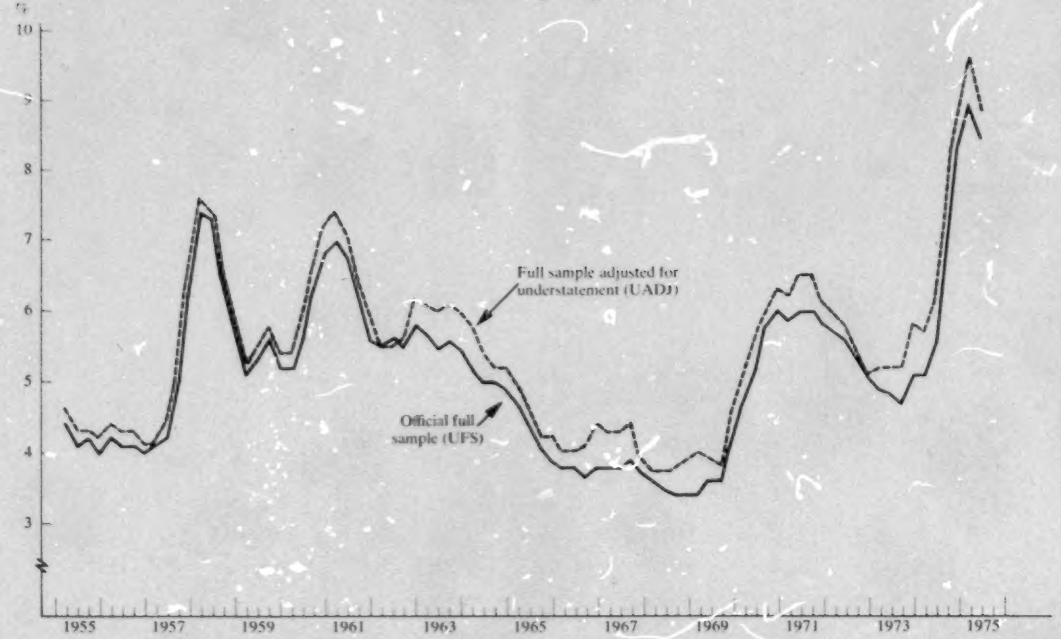
the two rates were the same (5702, 6201, 6202) and one where UADJ was 0.1 percentage point below UFS (6203). The periods in which the differences were greatest are similar to the above-noted periods when TCUAR was substantially above TCUOS.

UADJ does little to revise the timing of UFS cyclical turning points. However, UADJ shows a pattern of increasing relative to UFS from cycle to cycle in successive peak unemployment quarters. By comparison, there is not a clear pattern of UADJ rising relative to UFS in successive low unemployment quarters.

In the 1957-58 recession the unemployment rate in the high unemployment quarter (5802) was adjusted upward only slightly, from 7.4 percent (UFS) to 7.6 percent (UADJ). In the 1960-61 recession, the unemployment rate in the high unemployment quarter (6102) increased from 7.0 percent to 7.4 percent, or twice as much as in the prior recession. In the third and fourth quarters of 1971 the difference increased to 0.5 percentage point (6.5 versus 6.0 percent), and in the most recent recession the

Chart 1

Full-Sample and Bias-Adjusted Unemployment Rate
Second Quarter 1955—Third Quarter 1975
(Seasonally Adjusted)



difference in 7502 widened to 0.7 percentage point at which time UADJ exceeded 9 percent — a record high. The pattern of a larger unemployment gap in peak unemployment periods is consistent with the expectation that increased joblessness provides more candidates who are subject to misclassification and underenumeration in interview.

Whereas UFS exhibited a marked *V* pattern in 1973, reaching a low point in 7304, UADJ showed flatness throughout 1973. Thereafter the gap between unemployment rates rose, varying between 0.4 and 0.7 percentage point (7401-7503), and averaging 0.6 point which is slightly more than in other past periods of high or rising unemployment. Based on *Okun's Law*, which relates the GNP gap to unemployment, this is equivalent to an additional average annual output gap of about 2 percent. Compared with UFS, UADJ in 1974-75 seemed to be more consistent with the sharp increase in the percentage GNP gap in that period (i.e., *Okun's Law*-type predictions should do better based on UADJ).

Relation to Other Variables

Although UADJ and TCUAR differ from UFS in terms of level and variation in particular cyclical subperiods, the overall cyclical variation in these series is not greatly different. Therefore, in comparative correlations with other cyclical variables, large differences in $\bar{r}^2$ cannot be expected. Nevertheless, it will be of interest to observe the direction of change, if any, in $\bar{r}^2$ in correlations where reinterview unemployment is substituted for full-sample unemployment, as well as to note possible differences in multiple regression analysis, e.g., in econometric wage functions.

In a simple correlation analysis, quarterly UFS, UADJ, and TCUAR were separately correlated with (seasonally adjusted) GNP gap as an alternative aggregate utilization measure and with (seasonally adjusted) average initial claims for unemployment insurance under state programs as an independent (non-CPS) unemployment measure. Correlations were run for the period 5502-7402 ($n = 77$), and for the subperiod 6501-7402 ($n = 38$) when differences in unemployment between reinterview and original interview were relatively large. Coefficients of determination adjusted for degrees of freedom are shown in Table 6.

The differences in $\bar{r}^2$ within table columns are not large, and one pair of correlations is identical (top of column 1). Since the specific $\bar{r}^2$'s are not regarded as significantly different from one another at a reasonable level of type I error, it cannot be firmly concluded on this evidence that the reinterview data contain independent cyclical information. Nevertheless, the pattern of results and the direction of changes in $\bar{r}^2$ are suggestive. UADJ did "better" than UFS 3 out of 4 times with the difference between $\bar{r}^2$ relatively larger in the subperiod 6501-7402. By comparison, TCUAR

Table 6

$\bar{r}^2$ for Selected Economic Series

Period and series	Average initial claims for unemployment insurance[a] (1)	GNP gap[a] (2)
5502-7402		
Full sample (UFS)	.775	.757
Adjusted (UADJ)	.775	.770
Trend-cycle reconciled (TCUAR)	.708	.710
6501-7402		
Full sample (UFS)	.690	.743
Adjusted (UADJ)	.755	.794
Trend-cycle reconciled (TCUAR)	.728	.765

Note: The sign of r had the expected positive sign in all cases.
[a]Seasonally adjusted.

did not do as well as UFS against either the GNP gap or average initial unemployment insurance claims in 5502-7402. However, TCUAR did do marginally better than UFS in both cases in 6501-7402, although still not as well as UADJ. Within columns, $\bar{r}^2$'s were at all times higher in correlations which included UADJ than in correlations which used TCUAR, lending support to the choice of UADJ as the preferred overall measure.

A closer comparison of TCUAR-TCUOS (i.e., UADJ-UFS) and the GNP gap in specific GNP cycles revealed four extended periods in which the two series moved together sequentially: 6102-6203, 6401-6504, and 7104-7204 (declines), and 7301-7404 (increase). The relationship was particularly close during the 1971-74 period when the unemployment rate difference and the GNP gap both exhibited a pronounced *V* pattern. The low point of the cycle was the same (7301) in both series, whereas UFS did not bottom until 7304 — three quarters later. TCUAR by itself also demonstrated the same superior timing ability relative to UFS in that period.

Cyclical fluctuations in initial unemployment insurance claims closely followed TCUAR-TCUOS in the period of rapidly rising claims 5902-6101, as well as in the subsequent sharp decline through 1961. The two series also moved similarly in both the expansionary and contractionary phases of the unemployment cycle in the period after mid-1969, with TCUAR-TCUOS leading the 1973 upturn in initial claims by two quarters.

Wage Rate

We are interested here in investigating whether UADJ will add to the explanation of wage change and will shed any light on the effectiveness of wage controls in the economy. UADJ and UFS will be separately tested in the wage rate equation of the Commerce Department's Bureau of Economic Analysis (BEA) quarterly econometric model. The normal form of the wage function, which is an extension of the Phillips form, is:

$$W/\overline{W}_{1:4} = a + b_1 (1/\sum_{0}^{4} w_i \, UFS_{-i}) - b_2 (UFS - \overline{UFS}_{1:4})$$

$$- b_3 (\overline{UP}/\overline{U})_{0:3} + b_4 (HM/\overline{HM}_{1:4}) + b_5 (PC_{-1}/\overline{PC}_{2:5}),$$

where W is nonfarm money wages per private employee in the current quarter, expressed in relation to the average of the previous four quarters; w is preset weights spread over five quarters (rising slightly in quarter t-1 and declining thereafter); UFS is the full-sample unemployment rate; UP/U is the ratio of unemployed males age 25-54 to total CPS unemployment (a minor inconsistency in the presence of UADJ), expressed as a four-quarter average (the current and previous three quarters); HM is average weekly hours of production workers in manufacturing; and PC is the implicit price deflator for personal consumption expenditures, in which quarter t-1 is expressed in relation to the average of the previous four quarters.[7]

The unemployment rate serves as the traditional labor market pressure variable, with the change in unemployment reflecting the short-run immobility of labor. The primary worker ratio is a compositional variable; the hours ratio compensates for the absence of hours in the denominator of the wage rate (dependent variable); and lagged price change attempts to capture the effect of collective bargaining and price expectations. The important determinants of wage change are the unemployment and price variables.

What is the effect, *ceteris paribus*, of substituting *UADJ* for *UFS* in the wage function? The regression results for the period 5602-7402 are shown in Table 7. Equation 1 includes *UFS*, and equation 2 uses *UADJ*.

Comparing results, $\bar{R}^2$ is higher in equation 2 than in equation 1, but only slightly. The standard error of the estimate (SEE) of equation 2 is lower, and the Durbin-Watson (DW) statistic slightly higher indicating a small reduction in first-order serial correlation in the residuals. The presence of *UADJ* in equation 2 does not produce a sizable change in the regression coefficients of the level and change unemployment variables, although the independent impact of *UADJ* on calculated values of $W/\overline{W}_{1:4}$ indicates slightly more of a dampening effect on wages (com-

[7]For a detailed explanation, see Hirsch et al., 1973.

Table 7

Regression Results of Wage-Rate Equation
Second Quarter 1956—Second Quarter 1974

Equation	Constant	$1/\sum_{0}^{4} w_i UFS_{-i}$	$1/\sum_{0}^{4} w_i UADJ_{-i}$	$UFS\text{-}\overline{UFS}_{-1:4}$	$UADJ\text{-}\overline{UADJ}_{-1:4}$	$(\overline{UP}/\overline{U})_{-0:3}$	$HM/\overline{HM}_{-1:4}$	$PC_{-1}/\overline{PC}_{-2:5}$
Equation 1								
Regression coefficient	−.132	.00093		−.564		−.031	.612	.531
t-ratio	1.0	4.2		4.2		1.9	6.7	6.8
Partial $\bar{R}^2$	.00	.20		.20		.04	.40	.41
	($\bar{R}^2$ = .807; SEE = .0051; DW = 1.47)							
Equation 2								
Regression coefficient	−.084		.00099		−.596	−.037	.557	.538
t-ratio	0.6		4.2		4.6	2.5	5.9	7.2
Partial $\bar{R}^2$	.00		.20		.23	.07	.34	.43
	($\bar{R}^2$ = .822; SEE = .0049; DW = 1.55)							

pared with the impact of *UFS*) in periods of rising unemployment. Further supporting the use of the adjusted unemployment rate are a higher *t*-ratio and a higher partial $\bar{R}^2$ for the unemployment change variable in equation 2 compared with equation 1. In the presence of *UADJ*, *t*-ratios and partial $\bar{R}^2$'s for the unemployment mix and price change variables were also higher in equation 2 than in equation 1.

At key turning points in the wage cycle, i.e., at quarterly peaks and troughs of the dependent variable, *UADJ* produced more accurate predictions of wage change than *UFS* half of the time, although both equations tended to underestimate at peaks and overestimate at troughs. There was no difference in predicted wage rate changes from equations 1 and 2 in the post-sample period 7403-7404 based on actual values of the independent variables.

A comparison of the actual and calculated values of the change in wage rates serves as a test of the possible impact of wage controls. Since equations 1 and 2 presumably contain the major variables that determine wage change yet do not explicitly allow for the effect of controls or of "jawboning," we can look to the sign and size of the residuals to tell the story. Negative residuals in the control period would indicate that the explanatory variables in the equation would have produced a more rapid rise in wages than actually occurred so that the difference between actual and calculated values of the change in wage rates could be attributed to controls. Zero or positive residuals would indicate that controls had no measurable effect in holding down wage increases.

An examination of the residuals from equations 1 and 2 in the control period 7103-7402 showed that they were mainly positive in both cases, a result which fails to support the effectiveness of the wage controls, although the average difference between actual and calculated wage rate changes in equation 2 (which included *UADJ*) was slightly less than the average residuals from equation 1 (which used *UFS*). During the *guidepost* period 1962-66, however, the residuals from both equations were slightly negative, on average, indicating some restraining effect on wages, although the residuals did not differ in size.[5]

Differences in the regression results of equations 1 and 2 in the subperiod 6501-7402 were similar to those noted above, except that the *t*-ratio and partial $\bar{R}^2$ of the unemployment level variable in the subperiod

[5]Based on the finding of Tella and Tinsley (1967) and of Simler and Tella (1968), the inclusion of estimates of the labor reserve (potential labor force less actual labor force) in the wage function would likely reduce or eliminate negative residuals in the guidepost period, indicating little impact of moral suasion on holding down aggregate wage increases. In a more recent study, Gordon (1972) concluded that the wage guideposts failed to hold down wage rate increases, but found that wage controls in 1971-72 were moderately effective, restraining wages by about a half percentage point.

equation strengthened slightly when *UADJ* was used (increasing by 0.5 and 0.03, respectively), whereas in the longer period there were no such differences between equations for this variable. Also, although the residuals from the two subperiod equations were larger than in the full period results, *UADJ* in the subperiod regression slightly improved wage change predictions in each of the final six quarters ending in 7404, which included the post-sample estimates in the second half of 1974.

Labor Force Participation

Unemployment is a commonly used variable in labor force participation-rate functions to represent job opportunities or labor demand. We are interested in knowing the effect, if any, of substituting *UADJ* for *UFS* in a participation-rate function for secondary workers (all age-sex groups of working age except males age 25-54). We particularly want to know the possible impact on estimates of the cyclical sensitivity of labor force participation which is important in determining the size of *hidden unemployment*.

The labor force participation rate of secondary workers has been shown to be cyclically sensitive to unemployment (or employment) as an index of job opportunities[9] and exhibits an upward time trend. On net, increases in job opportunities (declining unemployment) result in rising labor force participation, while worsening opportunities (rising unemployment) result in declining labor force participation. The participation rate of prime-age male workers has not been found to be cyclically responsive to employment demand.

For present purposes we can use the simple form of the participation equation:

$$(L/P)_s = a + b_1 (UFS_{-1} + UFS_{-2})/2 + b_2 T + b_3 T^2$$

where the dependent variable is the secondary labor force participation rate, *UFS* (or *UADJ*) is the total unemployment rate which is expressed as an average of the two previous quarters, and T is a linear time trend. T and T^2 together reflect the rising nonlinear trend in $(L/P)_s$. Distributed lag analysis has shown that quarters t-1 and t-2 are the most significant for the unemployment variable, and there is no persuasive evidence that different weights should be applied to the separate quarters.

In his review of the literature, Mincer pointed out that lagging the employment (unemployment) variable eliminates most of the error of measurement bias that results from correlating labor force with unlagged employment. Mincer also convincingly argued that primary worker employment is a preferred cyclical index of labor demand. However, since

[9]For a fuller explanation and critique, see Tella (1964, 1965), Dernburg and Strand (1966), and Mincer (1966).

age-sex detail is not readily available for the reinterview data to calculate a primary worker demand variable, we will use the lagged total unemployment rate as an alternative. Since we wish to observe the effects of *UADJ* versus *UFS* on the cyclical sensitivity of $(L/P)_s$, *ceteris paribus*, full-sample estimates of the labor force in the dependent variable will be used in the alternative participation equations. Of course, the value of b_1 in an equation that includes both full-sample L and *UADJ* would not necessarily be the same as b_1 in an equation that used L adjusted by the reinterview data and *UADJ* (i.e., L adjusted in the same manner that *UFS* was adjusted to obtain *UADJ*). Since there is this inconsistency in using (unadjusted) L with *UADJ* in the same equation, we interpret any differences between the equations below simply as a test of using *UADJ* versus *UFS* as alternative proxy measures of the demand for labor for given estimates of labor supply. In the equations, t-ratios appear in parentheses below the regression coefficients. The regression period is 6304-7402.

$$(1)\ (L/P)_s = \underset{(167.0)}{0.565} - \underset{(5.9)}{0.313}UFS_{-1} + UFS_{-2}/2 + \underset{(4.2)}{0.00054}T + \underset{(5.7)}{0.000018}T^2.$$

$$\bar{R}^2 = .985;\ \text{SEE} = .0023;\ \text{DW} = 1.51.$$

$$(2)\ (L/P)_s = \underset{(144.5)}{0.563} - \underset{(4.7)}{0.272}UADJ_{-1} + UADJ_{-2}/2 + \underset{(4.0)}{0.00069}T + \underset{(4.8)}{0.000017}T^2.$$

$$\bar{R}^2 = .982;\ \text{SEE} = .0025;\ \text{DW} = 1.31.$$

The regression results of equations 1 and 2 are not distinctly different. $\bar{R}^2$ and SEE are similar; DW is slightly higher in equation 1. While all variables are highly statistically significant and the regression coefficient of unemployment is lower in equation 2, it cannot be concluded that the cyclical sensitivity of secondary worker participation has been significantly lessened by the introduction of *UADJ;* both of the regression coefficients fall in the low range of existing estimates. When an adjustment was made for autocorrelated error terms (Cochrane-Orcutt), the regression coefficient of the lagged adjusted unemployment rate rose and the regression coefficient of the lagged full-sample rate declined, but only slightly.

An alternative specification of the secondary participation function was tried. In addition to the unemployment rate lagged one quarter, the difference between the unemployment rate in quarters t-1 and t-2 was in-

cluded as a crude test to capture the possible (positive) impact of other household members becoming unemployed:

$$(3)\ (L/P)_s = \underset{(164.2)}{0.565} - \underset{(6.0)}{0.319}UFS_{-1} + \underset{(2.3)}{0.377}UFS_{-1} - UFS_{-2} + \underset{(3.5)}{0.00057}T + \underset{(5.9)}{0.0000207}T^2.$$

$$\bar{R}^2 = .986;\ \text{SEE} = 0.0022;\ \text{DW} = 1.60.$$

$$(4)\ (L/P)_s = \underset{(143.2)}{0.564} - \underset{(4.8)}{0.274}UADJ_{-1} + \underset{(1.9)}{0.277}UADJ_{-1} - UADJ_{-2} + \underset{(3.8)}{0.00065}T + \underset{(4.9)}{0.000018}T^2.$$

$$\bar{R}^2 = .982;\ \text{SEE} = 0.0025;\ \text{DW} = 1.41.$$

Again, the regression coefficient of the level of the adjusted unemployment rate was shown to be lower (equation 4 compared with equation 3), but not significantly. The sign of the unemployment change variable was positive and could be interpreted as reflecting an income effect or an additional worker effect (whereas the negative coefficient of the level of the unemployment rate reflects a discouraged worker effect). However, this variable is relatively weak, and the form of equations 1 and 2 is preferred. As was the case with the unemployment level, the regression coefficient of the unemployment change variable tended to be lower when adjusted values of unemployment were used.

The tendency toward a reduced cyclical responsiveness of secondary worker participation when *UADJ* was substituted for *UFS* in the different forms of the equation also occurred in two additional specifications — when the unemployment rate lagged one quarter was used as the only independent cyclical variable, and when the unemployment rate was separately lagged one quarter and two quarters in the same equation. The tendency was thus persistent and was not sensitive to the form of the participation function. The difference between the regression coefficients of the alternative unemployment rate variables in the $(L/P)_s$ function was greatest when the rates were expressed as UFS_{-2} ($b_1 = -.451$; $t = 3.0$); and $UADJ_{-2}$ ($b_1 = -.306$; $t = 2.3$).

An investigation of the quarterly residuals and post-sample predictions of the $(L/P)_s$ equations 1 and 2 did not reveal any striking differences. However, the dampening effects on secondary worker participation of the 1970 recession were better predicted by equation 2, while equation 1 did relatively better in predicting $(L/P)_s$ in the subsequent recovery up to mid-1974.

Summary and Conclusions

Census reinterview data have up to now been unexploited, yet contain new and potentially valuable economic information. Using these data, we have shown that when the official unemployment rate (UFS) is adjusted for response bias, it is consistently and significantly higher, with the gap between the unadjusted and the adjusted rate widening in the most recent quarters. There is a tendency for the gap to widen in periods when there are more unemployed persons subject to misclassification in original interview. The adjusted rate (UADJ) in the high unemployment quarter of the recent recession (7502) was estimated to be 0.7 percentage point above the official rate. For 1974-75, the understatement in UFS averaged 0.6 point.

UADJ exhibited some difference in cyclical behavior compared to UFS and in relation to other economic variables. Coefficients of determination tended to be higher, although not significantly, in selected periods when UADJ was substituted for UFS in correlations with average initial unemployment insurance claims, GNP gap, and wage rates. The inclusion of UADJ in a wage function provided no support for the effectiveness of wage controls. The use of UADJ as an alternative demand variable in a secondary labor force participation function did not revise previous estimates of the cyclical sensitivity of labor supply. Compared to UFS, UADJ appeared to be more consistent with the sharp rise in the percentage GNP gap in 1974-75.

The comparatively high level of UADJ implies that the labor market has been looser and potential output higher than previously realized. However, since UADJ-UFS consists mainly of secondary workers, the additional per-person hours and earnings contribution to GNP is less than for primary workers or for the average worker currently in the labor force.

The reinterview data indicate that the CPS also consistently understates total employment. Therefore, past inflation has occurred in the face of higher adjusted numbers of jobholders as well as jobseekers. These findings suggest that those past periods which have been regarded as full-employment periods based on official full-sample labor force data, as well as the choice of target rates of unemployment, should perhaps be reassessed.

It is hoped that the analysis and the time series reported here will encourage further research and experimentation with the reinterview data. Meanwhile, it would be desirable that more attention be given to improving the techniques of CPS interview, including placing greater reliance on self-reporting rather than on proxy respondents.

References

Bailar, Barbara A. "The Effects of Rotation Group Bias on Estimates From Panel Surveys." *Journal of the American Statistical Association,* March 1975, pp. 23-30.

Dernburg, T., and K. Strand. "Hidden Unemployment, 1953-62: A Quantitative Analysis by Age and Sex," *American Economic Review,* March 1966, pp. 71-95.

Gordon, Robert J. "Wage-Price Controls and the Shifting Phillips Curve." *Brookings Papers on Economic Activity,* Vol. 2. Washington: Brookings Institution, 1972, pp. 385-421.

Hirsch, A., M. Liebenberg, and G. Green. *The BEA Quarterly Econometric Model.* U.S. Department of Commerce, Bureau of Economic Analysis, Staff Paper No. 22, July 1973.

Mincer, J. "Labor Force Participation and Unemployment: A Review of Recent Evidence." In *Prosperity and Unemployment,* edited by R. A. and M. S. Gordon. New York: John Wiley and Sons, Inc., 1966, pp. 73-112.

Simler, N. J., and A. Tella. "Labor Reserves and the Phillips Curve." *The Review of Economics and Statistics,* February 1968, pp. 33-49.

Tella, A. "The Relation of Labor Force to Employment." *Industrial and Labor Relations Review,* April 1964, pp. 454-469.

Tella, A. "Labor Force Sensitivity to Employment by Age, Sex." *Industrial Relations,* February 1965, pp. 69-83.

Tella, A., and P. Tinsley. "The Labor Market and Potential Output of the FRB-MIT Model." *Proceedings of the American Statistical Association, Business and Economic Statistics Section,* December 1967, pp. 51-76.

U.S. Bureau of the Census. *The Current Population Survey Reinterview Program: January 1961 Through December 1966,* Technical Paper No. 19. Washington: Government Printing Office, 1968.

U.S. Bureau of the Census. *The Current Population Survey Reinterview Program: Some Notes and Discussion,* Technical Paper No. 6. Washington: Government Printing Office, 1963.

U.S. President's Committee To Appraise Employment and Unemployment Statistics. *Measuring Employment and Unemployment.* Washington: Government Printing Office, 1962, pp. 395-405.